

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 1217.P015PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. PCT/SG2002/000194	International Filing Date (day/month/year) 28 August 2002	Priority Date (day/month/year) 28 August 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ H04B 1/10, 7/216		
Applicant THE NATIONAL UNIVERSITY OF SINGAPORE et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 24 November 2003	Date of completion of the report 8 December 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer JUZER KHANBHAI Telephone No. (02) 6283 2176

I. Basis of the report**1. With regard to the elements of the international application:***

- ☐ the international application as originally filed.
- ☒ the description, pages 1-20, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages 21-27, received on 16 November 2004 with the letter of 16 November 2004
- ☒ the drawings, pages 1/6-6/6, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-34	YES
	Claims -	NO
Inventive step (IS)	Claims 1-34	YES
	Claims -	NO
Industrial applicability (IA)	Claims 1-34	YES
	Claims -	NO

2. Citations and explanations (Rule 70.7)

Claims 1-34: The invention defined by the amended claims relate to a method for reducing noise in a transformed signal which includes the identification of the one or more signal components based upon a channel estimate of the plurality of signal components and the reconstructing to provide a reconstructed transformed signal of the transformed signal.

No individual citation or obvious combination of citations disclose the identification of the one or more signal components based upon a channel estimate of the plurality of signal components and the reconstructing to provide a reconstructed transformed signal of the transformed signal. Hence, the claimed invention is novel and inventive.

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

As a result of the amended claims pages 21-27, the abstract page is incorrectly numbered page 27.

Claims

1. In a receiver of a communication system, a method for reducing noise in a transformed signal, said transformed signal having a plurality of signal components, said method comprising the steps of:
 - receiving a transformed signal by a detector of said communication system;
 - processing said transformed signal; and
 - reconstructing a predetermined number of times, by a reconstructing module, one or more signal components of said plurality of signal components, said reconstructing being based upon said processing step to thereby reduce noise in said transformed signal;wherein said processing step further comprises the steps:
 - identifying said one or more signal components based upon a channel estimate of said plurality of signal components; and
 - further wherein said reconstructing step further comprises the step of providing a reconstructed transformed signal of said transformed signal.
2. The method as claimed in Claim 1, wherein said processing step comprises the step of providing an estimated signal from said transformed signal at output of said detector and based upon said channel estimate.
3. The method as claimed in Claim 2, wherein said processing step further comprises the step of decision processing said estimated signal using a plurality of decision modules.
4. The method as claimed in Claim 3, wherein said decision processing step comprises the step of soft decision processing.

5. The method as claimed in Claim 3, wherein said decision processing step comprises the step of hard decision processing.
6. The method as claimed in Claim 1, wherein said reconstructing step further comprises the step of providing another estimated signal from said reconstructed transformed signal at said output of said detector and based upon said channel estimate.
7. The method as claimed in Claim 6, wherein said processing step further comprises the step of decision processing said another estimated signal using said plurality of decision modules.
8. The method as claimed in Claim 7, wherein said decision processing of said another estimated signal comprises the step of soft decision processing.
9. The method as claimed in Claim 7, wherein said decision processing of said another estimated signal comprises the step of hard decision processing.
10. The method as claimed in Claim 7, wherein said reconstructing step further comprises the step of determining whether said one or more signal components has been reconstructed said predetermined number of times
11. The method as claimed in Claim 10, wherein said reconstructing step further comprises the step of determining whether to process another one or more signal components of said plurality of signal components.
12. The method as claimed in Claim 11, and further comprising the step of providing current estimated signal for subsequent processing when determined that iteration of said another signal component is not required.

13. The method as claimed in Claim 11, wherein said reconstructing step further comprises the step of simultaneously reconstructing two or more of said another one or more signal components.
14. The method as claimed in Claim 11, wherein said reconstructing step further comprises the step of reconstructing, one at a time, each of said another one or more signal components.
15. The method as claimed in Claim 1, wherein said reconstructing step further comprises the step of simultaneously reconstructing two or more of said one or more signal components.
16. The method as claimed in Claim 1, wherein said reconstructing step further comprises the step of reconstructing, one at a time, each of said one or more signal components.
17. A receiver for reducing noise in a transformed signal, said transformed signal having a plurality of signal components, said receiver comprising:
 - a signal reconstructing section having:
 - a detector for detecting said transformed signal;
 - one or more decision modules, each of said one or more decision modules having an input coupled to output of said detector; and
 - a reconstructing module having one or more inputs, said one or more inputs being respectively coupled to output of said one or more decision modules,
 - wherein said reconstructing module is adapted to reconstruct one or more signal components of said plurality of signal components a predetermined number of times to thereby form a noise-reduced transformed signal; and

wherein said reconstructing module is adapted to provide a reconstructed transformed signal of said transformed signal;

further wherein said reconstructing module is adapted to identify said one or more signal components based upon a channel estimate of said plurality of signal components.

18. The receiver as claimed in Claim 17, wherein said one or more decision modules comprises one or more hard decision modules.
19. The receiver as claimed in Claim 17, wherein said one or more decision modules further comprises one or more soft decision modules.
20. The receiver as claimed in Claim 17, wherein said reconstructing module is adapted to perform reconstruction based on a relationship between a received signal component and a transmitted signal.
21. The receiver as claimed in Claim 17, wherein said reconstructing module is adapted to perform simultaneous reconstruction of two or more of said one or more signal components.
22. The receiver as claimed in Claim 17, wherein said reconstructing module is adapted to perform reconstruction of said one or more signal components signal components one at a time.
23. A communication system comprising:
 - a signal reconstructing section for reducing noise in a transformed signal, said transformed signal having a plurality of signal components, said signal reconstructing section having:
 - a detector for detecting said transformed signal;

one or more decision modules, each of said one or more decision modules having an input coupled to output of said detector; and

a reconstructing module having one or more inputs, said one or more inputs being respectively coupled to output of said one or more decision modules,

wherein said reconstructing module is adapted to reconstruct one or more signal components of said plurality of signal components by a predetermined number of times to thereby form a noise-reduced transformed signal;

wherein said reconstructing module is adapted to provide a reconstructed transformed signal of said transformed signal;

further wherein said reconstructing module is adapted to identify said one or more signal components based upon a channel estimate of said plurality of signal components.

24. The communication system as claimed in Claim 23, wherein said one or more decision modules comprises one or more hard decision modules.
25. The communication system as claimed in Claim 23, wherein said one or more decision modules further comprises one or more soft decision modules.
26. The communication system as claimed in Claim 23, wherein said reconstructing module is adapted to perform reconstruction based on a relationship between a received signal component and a transmitted signal.
27. The communication system as claimed in Claim 23, wherein said reconstructing module is adapted to perform simultaneous reconstruction of two or more of said one or more signal components.

28. The communication system as claimed in Claim 23, wherein said reconstructing module is adapted to perform reconstruction of said one or more signal components one at a time.
29. A signal reconstructing section for a receiver to reduce noise in a transformed signal, said transformed signal having a plurality of signal components, said signal reconstructing section comprising:
- a detector for detecting said transformed signal;
 - one or more decision modules, each of said one or more decision modules having an input coupled to output of said detector;
 - and
 - a reconstructing module having one or more inputs, said one or more inputs being respectively coupled to output of said one or more decision modules,
- wherein said reconstructing module is adapted to reconstruct one or more signal components of said plurality of signal components by a predetermined number of times to thereby form a noise-reduced transformed signal.
- wherein said reconstructing module is adapted to provide a reconstructed transformed signal of said transformed signal;
- further wherein said reconstructing module is adapted to identify said one or more signal components based upon a channel estimate of said plurality of signal components.
30. The signal reconstructing section as claimed in Claim 29, wherein said one or more decision modules comprises one or more hard decision modules.
31. The signal reconstructing section as claimed in Claim 29, wherein said one or more decision modules further comprises one or more soft decision modules.

32. The signal reconstructing section as claimed in Claim 29, wherein said reconstructing module is adapted to perform reconstruction based on a relationship between a received signal component and a transmitted signal.
33. The signal reconstructing section as claimed in Claim 29, wherein said reconstructing module is adapted to perform simultaneous reconstruction of two or more of said one or more signal components.
34. The signal reconstructing section as claimed in Claim 29, wherein said reconstructing module is adapted to perform reconstruction of said one or more signal components signal components one at a time.